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Author(s): Migliori, Amy Davenport

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Tech Snapshot Biology

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CHIMERIC PROTEIN TREATMENT OF PIERCE DISEASE

*Chimeric protein for the treatment of
Pierce disease in effected grape vines*



SUMMARY

Pierce disease is an economically costly disease for several agricultural crops, including grapes, citrus, and olives. An invasive insect species, the glassy-winged sharpshooter, harbors a gut bacteria that kills grape vines. The bacteria destroys the xylem, the water transport tissue in plants. Los Alamos researchers have designed a technology to target and kill the source of Pierce disease. The treatment does not require the use of pesticides or the removal and replacement of the effected vines.



MARKET

Collectively the agricultural industries in California for grapes, citrus, and olives alone represent in excess of 9 billion dollars in sales per year. Traditionally, Pierce disease is treated by pesticide use, but a societal move away from the use of pesticides necessitates a better solution to help mitigate crop loss. Additionally, many pesticides are unacceptable for organic crop growth. Our solution can be applied via spraying, or genetically coded into the DNA of the effected crop.

BENEFITS

Traditionally, insect-caused plant diseases are treated by pesticide application and removal of effected plants. Our technology uses a protein that has been genetically engineered to find and destroy bacterial infections without the need to replace plants or apply toxic pesticides to the crops.

- Effective treatment for a growing agricultural problem with huge potential economic impact
- Removes need to treat using pesticide application
- Improves crop yield in areas effected by diseases caused by *X. fastidiosa*
- Multiple methods of application including spray and genetic modification
- Potentially suitable for California organic food practices

CONTACT

Amy Migliori
amymigliori@lanl.gov
505-667-2905



WHY WE ARE BUILDING CHIMERIC PROTEIN TREATMENT OF PIERCE DISEASE

Our technology addresses a growing problem in the agricultural sector in which an invasive insect species, the glass-winged sharpshooter, carries the *X. fastidiosa* bacteria. The bacteria causes Pierce disease in plants, blocking the water-carrying tissue in plants such as grape vines and citrus. Infestation leads to plant disease and death. Conventional treatment of Pierce disease requires application of toxic pesticide or removal of the diseased plants. The rise of organic farming and societal pressure to move away from pesticide use necessitates a viable alternative such as application of the Laboratory's chimeric protein.



WHAT'S BEHIND OUR TECHNOLOGY

We have designed a chimeric protein to treat Pierce disease. A chimeric protein is the genetic combination of two functional regions to create a single protein that specifically targets and kills the bacteria causing the Pierce disease infection. Traditional treatments include efforts to eradicate the insect spreading the bacterial vector, the glassy-winged sharp shooter; use of parasitic bacteria; use of modified bacterial viruses; and the removal of effected plants to limit disease impact. Our method is an improvement over other methods because it is easily applied to effected plants, does not use pesticides, and does not introduce a bacteria or virus, and avoids costly removal of diseased plants.



OUR COMPETITIVE ADVANTAGES

Our technology offers an effective method for the treatment of crop diseases caused by *X. fastidiosa* infection that treats infections without the application of pesticides or the removal of effected plants. The Laboratory's chimeric protein represents an easily-applied, effective method for managing an economically costly disease without necessitating the removal of infected plants.



OUR TECHNOLOGY STATUS

The chimeric protein has been introduced into Thompson seedless grape plants, and extract from the plant xylem has been proven effective in inhibiting growth of *X. fastidiosa*. We are seeking licensing partners to further develop the delivery mechanism for the chimeric protein for use in agricultural settings.